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SEMS DocID 593756

ADDITIONAL PHASE II INVESTIGATIONS, SOIL GAS SURVEY AND BEDROCK AQUIFER EVALUATION

AMERICAN GLUE AND RESIN, INC.
MIDDLETON, MASSACHUSETTS

MASS. DEQE CASE NO. 3-168

Prepared for:

AMERICAN GLUE AND RESIN, INC.
Middleton, Massachusetts

Prepared by:

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SEPTEMBER 1988

APPENDICES

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1.0 INTRODUCTION

Further soil and groundwater investigations on the American Glue & Resin, Inc. (AGR) property were conducted by Liberty Environmental Systems, Inc. (LES) between May and September 1988. The work which included a soil gas survey, bedrock monitoring wells, and water sampling, was undertaken to establish time trends in water quality in the overburden aquifer and to determine whether the bedrock aquifer is contaminated under the AGR property from past activities at the facility.

Previous investigations were conducted by Environmental Compliance Services, Inc. (ECS) in 1987 beginning with an environmental audit study (February 1987 report) and a Phase II investigation (October 1987 report). LES in association with David E. Burmaster, Ph.D. studied the ECS Phase II results and prepared a Phase II Interpretive Report (October 1987).

The AGR property is located in the northwestern portion of the Town of Middleton, Massachusetts at 40 School Street (See Figure 1). The site is bounded by Boston Brook to the northwest; School Street to the southeast; a residence and barn (34 School Street) to the southwest; and Tom Sawyer Beverage (42 School Street), a bottling plant, to the northeast. Across School Street to the southeast is a wetland area.

The site consists of approximately 3.2 acres of land. The southeastern half of the site is occupied by on-site buildings and associated paved and graveled areas (See Figure 2). One main building exists on the site, constructed from cement block. Attached to the building on the eastern side is a prefabricated office building. Also on-site is a storage building and a number of storage trailers.

The northwestern third of the site is a wetland area associated with Boston Brook. The area between the wetland and the active portion of the site is covered with upland vegetation.

The site, in general, is relatively flat sloping gently toward Boston Brook, with the exception of a knoll directly behind the main building. The knoll rises approximately 20 feet above the surrounding grade.

2.0 SOIL GAS SURVEY

LES completed a soil gas survey at this property on May 4, 1988. A total of 25 points were sampled on that date, as shown in Figure 3. The areas investigated included an area to the east of the manufacturing facility, in and around the location of former and present buried underground storage tanks. A second area was sampled to the rear of the manufacturing facility in the loading and unloading area. Finally, the area near a suspected sand infiltration system to the rear of the property, was also investigated.

2.1 FIELD PROCEDURE

The soil gas survey was conducted using a PhotoVac 10S50 portable gas chromatograph outfitted with a highly-sensitive photoionization detector. A manually-operated impact driver was used to pre-punch 1/2-inch diameter holes to a depth of approximately 30 inches. A specially-constructed 1/4-inch diameter stainless steel gas sample probe was then driven to a depth of 36 inches at each point and connected by a teflon transfer line to the PhotoVac gas chromatograph. The GC was programmed to purge the probe, pull a pre-set soil vapor sample from unsaturated soils and automatically inject a portion of that sample into a chromatographic column. This column separates the volatile organic components which are then measured by a photoionization detector, resulting in a chromatographic "fingerprint" of the type and relative concentration of volatiles present in the soil gas. Blank samples of the ambient air were taken before and after each soil gas sample to eliminate background interferences from volatiles in the surrounding atmosphere, or trace residuals left within the sampling system between samples.

During the initial soil gas survey, shallow groundwater conditions were encountered in a couple of locations. This required that the sampling probes be installed to a depth of 24 inches, or approximately one foot shallower than normal procedure. This precaution was necessary to ensure that no water was withdrawn from the soil into the gas chromatography instrument.

2.2 RESULTS

Results of the soil survey are shown in Figure 3. Data in this Figure are based on a total response factor from all peaks recorded by the instrument at that location and expressed in milivolt-seconds. An analysis of the retention time of each peak at each location is included in the Appendix. After reviewing these data it became apparent that 5 peaks predominated the chromatographs. The relative response level of each of these peaks at each sample location is contoured in Figures 4 through 8.

From these soil gas patterns, contamination in the subsurface appears to be centered around the underground tank installations and the center of the driveway to the rear of the manufacturing facility. The highest response (at location No. 3), was a measurement made in a pile of soil which had been removed during the replacement of tanks. The strong total response by the gas chromatograph indicates that a residual level of contamination remains in this soil.

In an attempt to determine initial identification of soil gas compounds, relative retention factors were calculated for each of the 5 peaks in question. Since the retention time of benzene was established in the field, all other peaks were expressed as a function of their retention compared to benzene. LES had previously determined relative retention times for these compounds (for the chromatographic column in present use) found in the groundwater at American Glue and therefore could attempt to use this data to identify compounds in the soil gas.

Table 1 shows the calculated retention factor based on retention times for the compounds in question. As can be seen using benzene as a basis, three compounds have retention times greater, and in two compounds retention times are shorter than benzene. Applying these retention factors to the retention times of peaks identified from the survey, proved inconclusive in identifying specific compounds. As shown in Figure 6, the sixty to sixty-four second peak was tentatively identified as a benzene peak based on comparison with a calibrant gas sample analyzed during the survey.

Although positive identification of other specific compounds could not be made from this analysis, some conclusions can be drawn from the data.

Based on measurements made at the sand filtration system it appears unlikely that this area is a significant source of contamination to groundwater. Relatively high responses have been measured in areas thought to be source areas, that is, (1) the area surrounding the underground tanks and, (2) the area near the septic tank installation.

It is also apparent from this data that soil gas concentrations drop off dramatically with distance from the assumed source areas. Finally, it appears that the initial conclusions based on data collected by ECS, with respect to source areas, were essentially correct. The exception is the sand filtration system which does not appear to be a source. The weak response at location 22, seen in Figure 3 for the 44-45 second peak, is assumed to be a degradation compound because of its short retention time. Generally speaking, degredation products tend to be lighter molecular weight compounds and therefore show up earlier in a chromatograph.

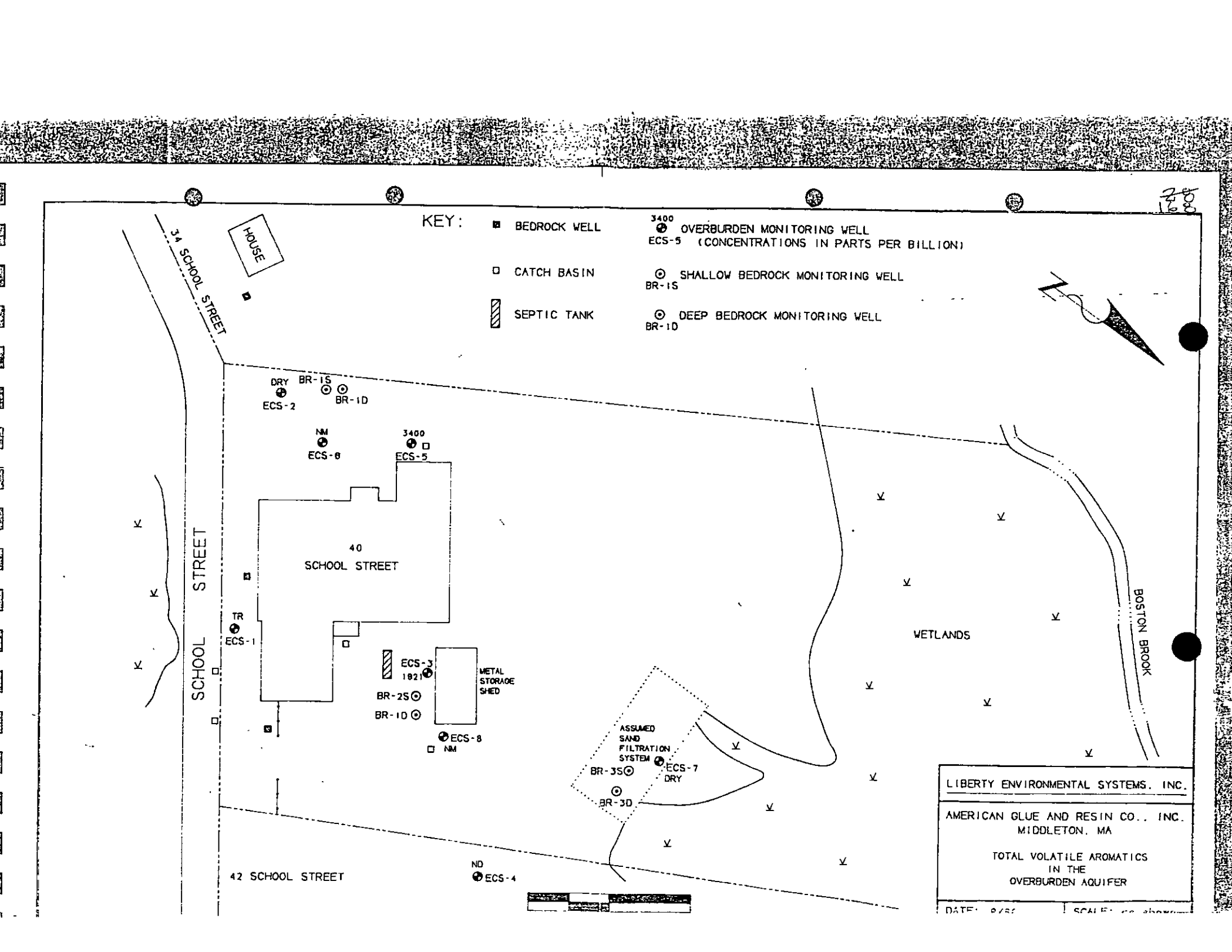
3.0 BEDROCK AQUIFER EVALUATION

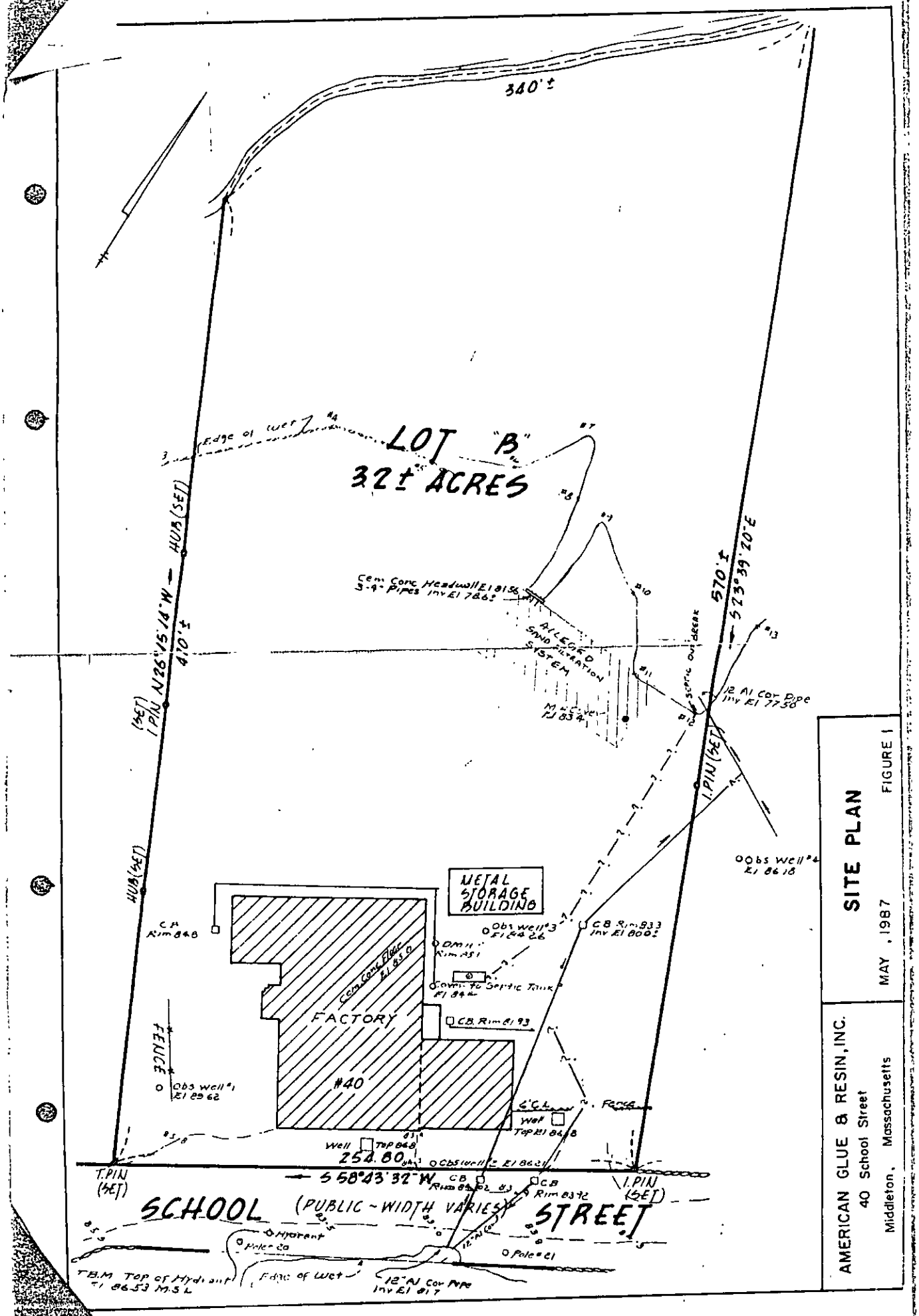
3.1 FRACTURE TRACE ANALYSIS

A fracture trace analysis was initiated to delineate potential preferred directions of groundwater migration in the vicinity of the American Glue & Resin facility. Such a delineation was attempted for this site, however no bedrock outcrops were found on this site. An investigation of bedrock outcrops was conducted in the area adjacent to the site to determine if projectable fracture trends may be present. Several bedrock outcroppings were found in the adjacent area which were found to be quite massive, without distinct measurable fracture planes. As a result, no further fracture trace studies were conducted.

3.2 INSTALLATION OF BEDROCK MONITORING WELLS

To test the bedrock aquifer for the occurrence of VOCs and to assess groundwater flow conditions, 3 bedrock monitoring well pairs were installed on the site during the period, August 2 - August 15, 1988. Accu-Drill Artesian Well Company of Windham, New Hampshire installed the wells. The locations of the wells are shown in Figure 2.


KEY:
BEDROCK WELL
CATCH BASIN
SEPTIC TANK
3400 ECS-5 OVERBURDEN MONITORING WELL (CONCENTRATIONS IN PARTS PER BILLION)
BR-1S SHALLOW BEDROCK MONITORING WELL
BR-1D DEEP BEDROCK MONITORING WELL
34 SCHOOL STREET
HOUSE
DRY BR-1S BR-1D ECS-2
NM ECS-6
3400 ECS-5
40 SCHOOL STREET
SCHOOL STREET
TR ECS-1
ECS-3 1821
METAL STORAGE SHED
BR-2S
BR-1D
ECS-8 NM
ASSUMED SAND FILTRATION SYSTEM
BR-3S
ECS-7 DRY
BR-3D
WETLANDS
BOSTON BROOK
42 SCHOOL STREET
ND ECS-4
LIBERTY ENVIRONMENTAL SYSTEMS, INC.
AMERICAN GLUE AND RESIN CO., INC.
MIDDLETON, MA
TOTAL VOLATILE AROMATICS IN THE OVERBURDEN AQUIFER
DATE: 8/86
SCALE: as shown



AMERICAN GLUE & RESIN, INC.
40 School Street
Middleton, Massachusetts

SITE PLAN

MAY, 1987

FIGURE 1

3.00 PRESENT ON SITE HAZARDOUS WASTE

American Glue and Resin Co.'s current manufacturing processes and management practices insure that there is no intentional generation of hazardous waste as defined by 310 CMR 30.1. There are however, a number of potential sources of hazardous waste on site.

Presented below are potential hazardous waste generation sources and in house procedures to control them:

1. Raw Material Spillage - Spillage of a number of raw materials used on site could result in the production of a hazardous waste. Table 2 contains a list of raw materials which, if released, could be considered hazardous. Corresponding MSDS Sheets are contained in Appendix B. Proper handling of these raw materials should eliminate the potential for spillage. Any spillage which might however, occur due to human error, would be contained, collected and disposed of in a proper manner.

2. Incidental Spillage of Product During Production - During production incidental spillage of product sometimes occurs. Current practice is to allow spillage to dry and/or pick-up with speedi-dry then handle it as a solid waste.

3. Production of Off-Spec Product - Occasionally a product may be produced which is not of performance specifications. These products are stored and then reintroduced into glue production which is compatible with their make up.

4. Wash Down Waters and Customer Tote Waters - From an economic/operational end these waters are directly recycled and fed back into the manufacturing process. Occasionally, if customers overfill the returned totes the volume of accumulated wash and tote waters will exceed production needs. In these instances the excess materials are contract hauled to Lawrence Sewer District.

5. Underground Storage Tanks - Currently there are two underground storage tanks located on site. Any leakage or spillage of product during filling would be considered a hazardous waste. One tank is a 3,000 gallon toluene (toluol) tank approximately 10 years in age. Appendix C contains the appropriate Form 290 for this tank. The second is a gasoline storage tank of unknown size and age. This tank has not been used during American Glue and Resin Co. operation at the site. Approximate locations of the tanks are shown in Figure 2.

Inventory records of the toluene tank were reviewed regularly by American Glue and Resin Co. to detect any measurable loss of product, none was noted. Subsequent to this investigation the tank was emptied to eliminate any possible release.

No information on the underground gasoline storage tank is available. Both tanks, however, will be excavated within the next 2 months to both eliminate the potential source and aid in determining if a release has occurred.

Table 3 is included summarizing the potential on site hazardous waste sources. Also included on this Table are specific waste constituents associated with each source. It should be noted that in the past Trichloroethylene may have been used in place of 1,1,1-Trichloroethane.

An important aspect of any investigation of potential hazardous waste releases to the environment is the identification of pathways of release. Table 3 also contains these pathways for each constituent. The first and most likely pathway, was a system of floor drains contained throughout the building. These drains were sealed in October of 1986. Their destination is not known, they may lead directly to the ground, to an on site septic system or to on/off site storm drainage.

There are no records of the construction details of the septic systems. Based on a limited site inspection and conversation with the owner it is assumed to consist of a tank exiting to a leech field near the brook/wetlands in the rear of the building.

A number of catch basins are contained on the site. Based solely on visual observation the culverts appear to be connected to the road storm sewers extending across the site, and discharge to the brook/wetlands in the rear of the building. It is currently not known if there is any direct interconnection of the storm sewer and the septic system. Figure 2 shows approximate location of catch basins, and outfalls, and assumed locations of the septic system.

Another potential contamination path would be wastes discharged directly to the ground. These wastes would either enter the ground directly through infiltration or would flow into on site catchments and/or surface water bodies.

The last potential contamination pathway would be leakage from either of the two underground storage tanks or associated piping directly into the ground.

4.00 HISTORIC RELEASE POTENTIAL

Historically it is difficult to determine the extent of recycling management and good housekeeping practice, with the knowledge that numerous floor drains were in existence at this facility. Reasonable assumption can be made that unintentional or intentional releases of materials to the subsurface through these drains may have historically occurred. The frequency and volume of such release(s) is unknown.

Our recent review of the Middleton Board of Health records revealed that on one occasion dumping occurred directly into the swamp across the road (see Appendix D). However, this incident occurred in 1973 when Glennon American, not American Glue, owned and operated a glue manufacturing facility on the property.

5.00 CONCLUSION

Based on these past and present activities occurring at American Glue and Resin Co., as outlined in this report, it is Environmental Compliance Services, Inc. (ECS) opinion that hazardous wastes and/or constituents of hazardous wastes may have been released to the environment in and around American Glue and Resin Co. not necessarily directly attributed to American Glue and Resin Co. Investigations into compiling further historical data to further substantiate these possibilities are continuing.

As a result of these findings it is ECS's recommendations that a Phase 2 investigation be implemented as outlined in Appendix E.

Implementation of Phase 2 will include the development of a health and safety plan as outlined in Appendix F.

TABLES

TABLE 1

RAW MATERIAL INVENTORY

Product	% Usage	Product Use
Polyvinyl Acetate Polymers	50	Acetate Glue
Potato Dextrin	15	Dextrin Glue
White Dextrin	15	Dextrin Glue
Toluene (Toluol)	6	Acetate Glue
TXIB Plasticizer (Propylene Glycol)	5	Acetate Glue
1,1,1-Trichloroethane	3	Acetate Glue
ASP102 Clay (Aluminum Silicate)	2	Acetate Glue
Calcium Chloride	1	Dextrin Glue
Sodium Nitrate	1	Dextrin Glue
Borated Polyvinyl Alcohol	1	Acetate Glue
Calcium Carbonate	1	Acetate Glue
Paragum 146 Acrylic Thickener	<1	Acetate Glue
Polyvinyl Alcohol Powder	<1	Acetate Glue
Natural Rubber Latex	<1	Acetate Glue
Borax	<1	Dextrin Glue
Hydrochloric Acid (Muriatic Acid)	< .75	Dextrin & Acetate
Phenol (Carbonic Acid)	< .50	Dextrin & Acetate
Urea Crystals	< .50	Dextrin & Acetate
Acrylic Polymers	< .50	Acetate Glue

RAW MATERIAL INVENTORY (cont'd)

Product	% Usage	Product Use
Corn Syrup	< .05	Dextrin Glue
Silicone Defoamers	< .05	Acetate Glue
? Cellosolue Acetate (Glycol Ether)	< .05	Acetate Glue
? Santicizer 141 (Phosphate Plasticizer)	< .05	Acetate Glue
Formaldehyde	< .005	Dextrin & Acetate
Deodorizing Kerosene	< .005	Acetate Glue
85% Phosphoric Acid	< .005	Dextrin & Acetate
35% Hydrogen Peroxide	< .005	Dextrin & Acetate
Caustic Soda	< .005	Dextrin Glue
Clorox	< .005	Acetate Glue
Boric Acid Powder	< .005	Acetate Glue
? Tritoh X100 Wetting Agent	< .005	Acetate Glue
Triethylnolamine	< .005	Acetate Glue
Cane Sugar	< .005	Acetate Glue
Hexylene Glycol	< .005	Acetate Glue
Diethylene Glycol	< .005	Acetate Glue

TABLE 2

MATERIALS CONSIDERED HAZARDOUS IF RELEASED

Material	Hazardous Characteristic and I.D. Number	% Usage
Toluene (Toluol)	Listed - U220	6
1,1,1-Trichloroethane	Listed - U226	3
Hydrochloric Acid	Corrosivity - D002	< .75
Carbonic Acid	Listed - U188	< .50
Formaldehyde	Listed - U122	< .005
85% Phosphoric Acid	Listed - U195	< .005
Caustic Soda	Corrosivity - D002	< .005

TABLE 3

EXISTING AND HISTORICAL HAZARDOUS WASTE
POTENTIAL RELEASES ON SITE

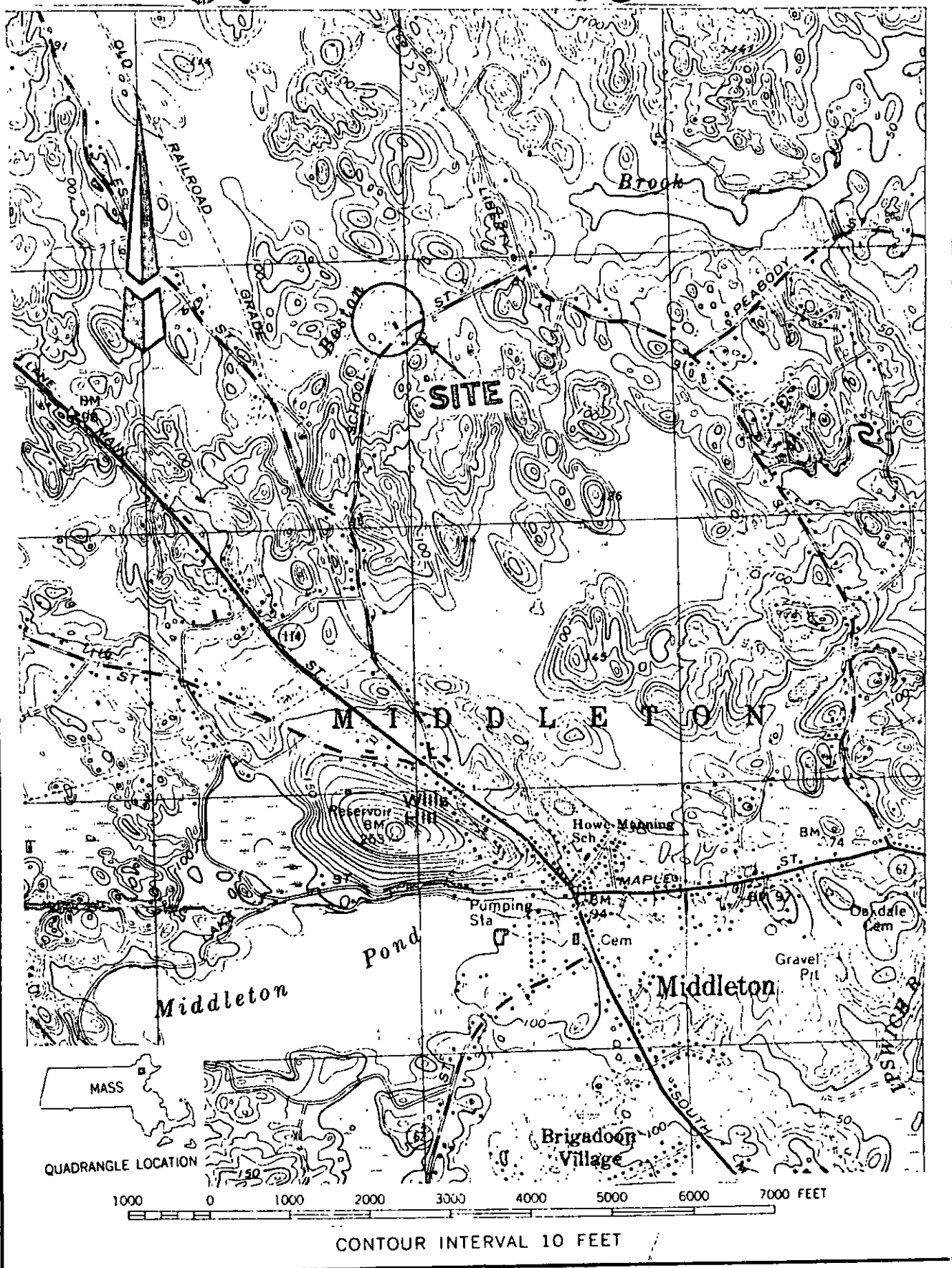
Existing:

Potential Source	Principal Waste Constituents	Potential Pathway
Raw Material Spillage	- Toluene - 1,1,1-Trichloroethane - Formaldehyde - Corrosives	- Floor Drains* - Directly to Ground - Storm Sewers - Septic System - By Overland Flow to Surface Waters
Spillage of Product During Manufacture	- Toluene - 1,1,1-Trichloroethane - Formaldehyde	- Floor Drains* - Storm Sewers - Septic System
Wash Down Waters and Customer Tote Waters	- Same As Above	- Same As Above
Underground Storage Tanks	- Toluene - Benzene - Xylenes - Other Hydrocarbons	- Directly to Subsurface

Historical:

Similar to above except additional waste constituents including Trichloroethylene may have been present. Also evidence exists of intentional release of unknown materials to swamp and ground.

* Sealed in October of 1986, eliminating this as an existing pathway.

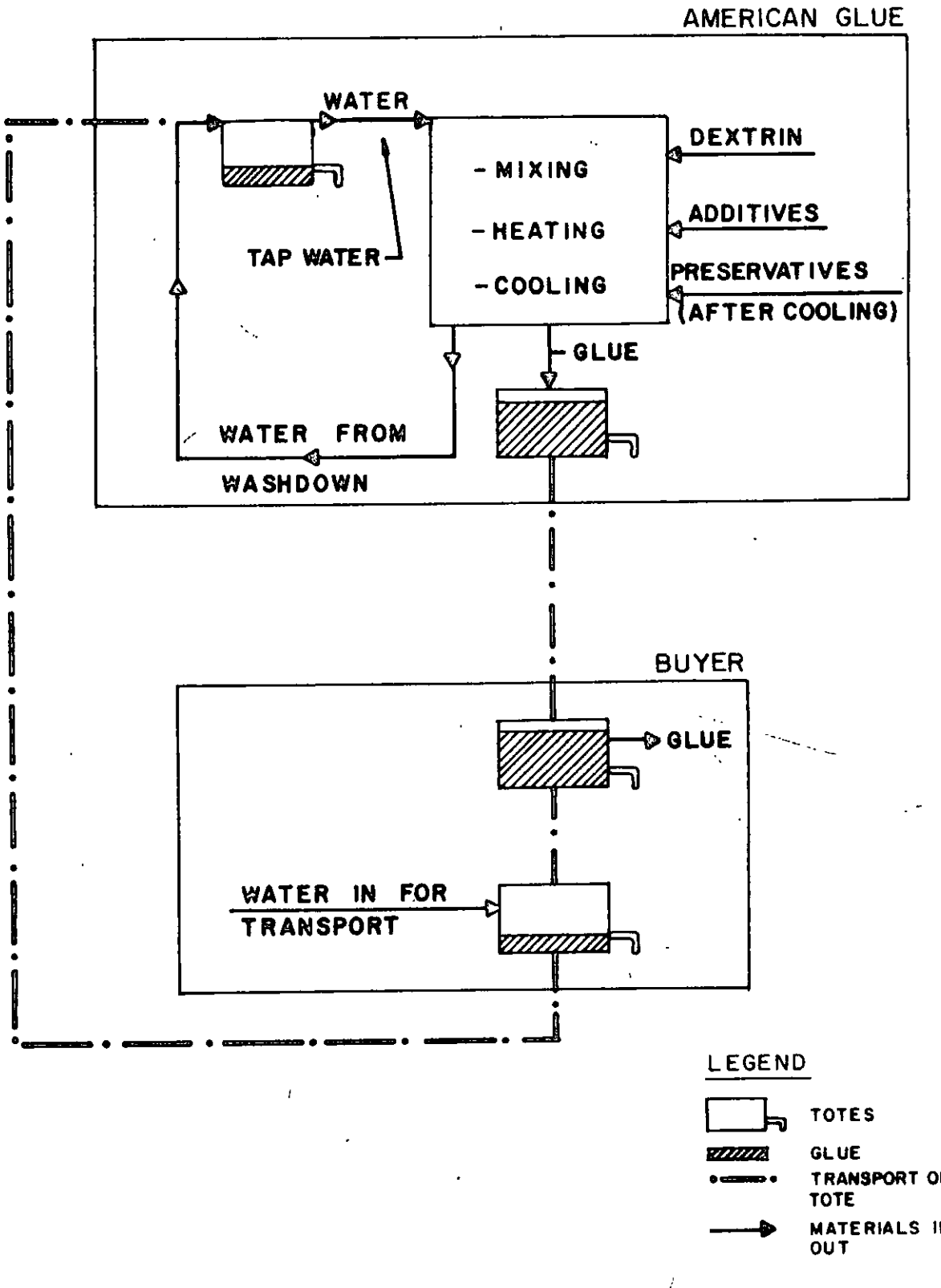


AMERICAN GLUE & RESIN, INC.
40 School Street
Middleton, Massachusetts

LOCUS PLAN

FEBRUARY, 1987

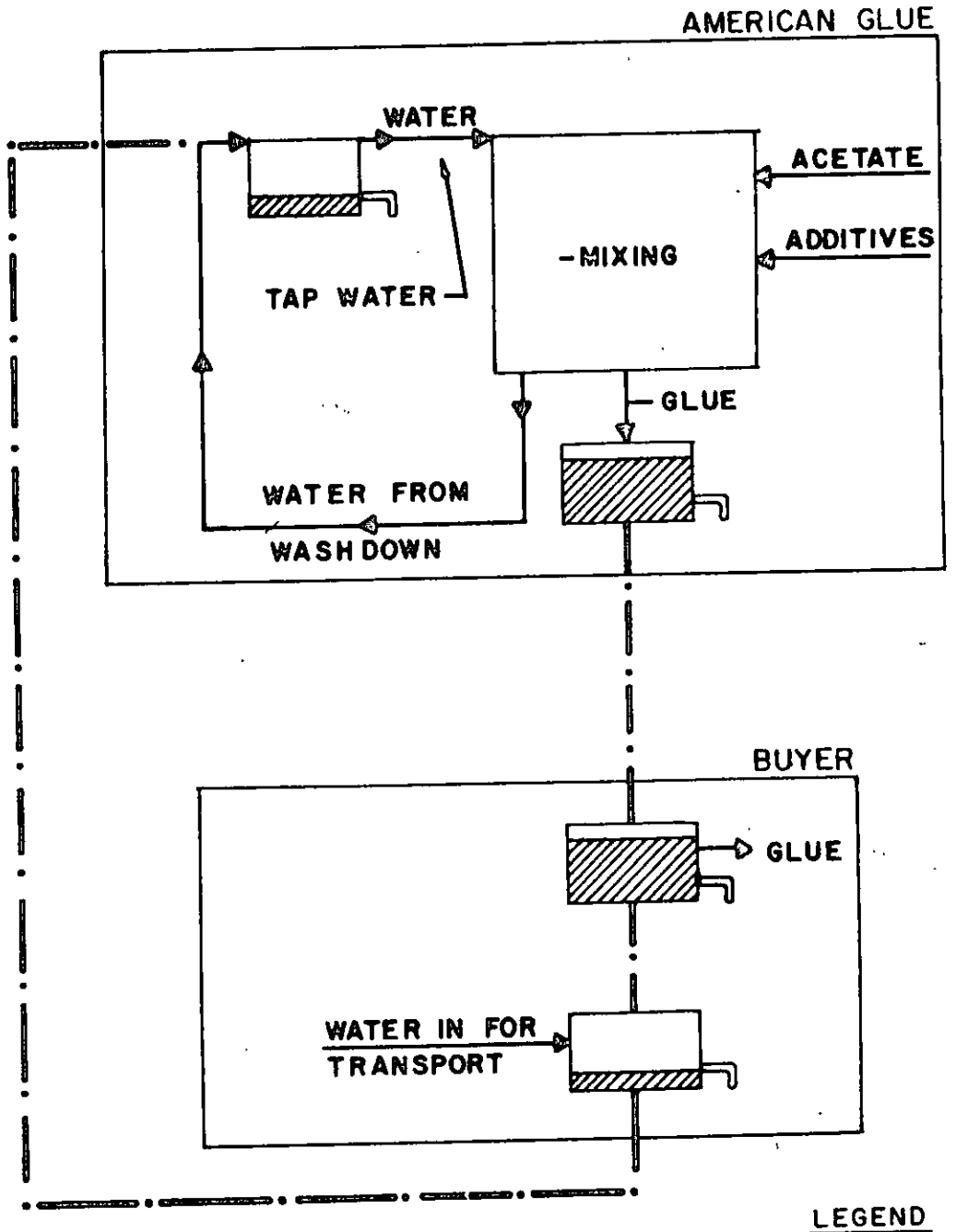
FIGURE 1



AMERICAN GLUE & RESIN, INC.
40 School Street
Middleton, Massachusetts

DEXTRIN GLUE PROCESS

FEBRUARY, 1987



AMERICAN GLUE & RESIN, INC.
40 School Street
Middleton, Massachusetts

ACETATE GLUE PROCESS

FEBRUARY, 1987

FIGURE 4

APPENDIX A

LIMITATIONS

APPENDIX A

LIMITATIONS

1) The findings set forth in the site assessment report are strictly limited in time and scope to the date of the evaluation, and such findings shall not be used by any one other than client and shall not apply prospectively, and shall not be used for any other purpose than that set forth herein.

2) This report contains recommendations which are partially based on the analysis of data accumulated at the time and place set forth in the report. However, further investigations may reveal additional data or variations of the current data which may require the enclosed recommendations to be reevaluated.

3) This report has been prepared in accordance with generally accepted practices and exclusively for client. No other warranty, expressed or implied, is made.

APPENDIX B

MSDS SHEETS

COMMON NAME: Toluol CHEMICAL NAME: Toluene

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ___ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	92.1 g/g-mole	
Specific gravity	.86 @ 25 °C	
Solubility: water	100 @ 20 °C	
Solubility: ___	@ °C	
Boiling point	111 °C	
Melting point	-95 °C	
Vapor pressure	22 mmHg @ 20 °C	
Vapor density	3.14 @ 20 °C	
Flash point	°C	
(open cup 4°C ; closed cup ___)		
Other: ___		

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes		
Ingestion	Yes		
Skin/eye absorption	Low		
Skin/eye contact	Yes		
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: ___			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility	Yes		
Toxic byproduct(s):	Yes		
Carbon Dioxide			
Carbon Monoxide	Yes		
Flammability			
LFL		1.27%	
UPL		7.1%	
Explosivity			
LEL			
UEL			

COMMON NAME: 1,1,1-Trichloroethane CHEMICAL NAME: _____

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ___ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	g/g-mole	
Specific gravity	1.306 @ 25 °C	
Solubility: water	0.07G/100G @ 25 °C	
Solubility: _____	@ °C	
Boiling point	165/79 °C	
Melting point	°C	
Vapor pressure	100 mmHg @ 20 °C	
Vapor density	4.55 @ °C	
Flash point	°C	
(open cup None ; closed cup ___)		
Other: _____		

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes	TLV 350 PPM	
Ingestion	Low	LD_{50} 8.6 to 15.0 g/kg	
Skin/eye absorption	Low		
Skin/eye contact			
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: _____			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility			
Toxic byproduct(s):			
_____			
Flammability (STP in air)			
LFL		6.7% @ 100°C	
UPL		17.2% @ 100°C	
Explosivity			
LEL			
UEL			

COMMON NAME: Phosphoric Acid (85%) CHEMICAL NAME: Phosphoric Acid

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ___ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	g/g-mole	
Specific gravity	1.692 @ °C	
Solubility: water	100% @ 25 °C	
Solubility: _____	@ °C	
Boiling point	154 °C	
Melting point	23 °C	
Vapor pressure (100%)	0.0285 mmHg @ 20 °C	
Vapor density	@ °C	
Flash point	°C	
(open cup ____; closed cup ____)		
Other: _____		

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes	PEL/TWA 1mg/m^3	
Ingestion		LD_{50} (RAT): 3500 mg/kg	
Skin/eye absorption	Yes		
Skin/eye contact	Yes	LD_{50} (Rabbit) 1260mg/kg	
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: _____			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility	No		
Toxic byproduct(s):			
_____			
_____			
Flammability	No		
LFL			
UPL			
Explosivity	No		
LEL			
UEL			

COMMON NAME: Caustic Soda CHEMICAL NAME: Sodium Hydroxide

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ___ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	g/g-mole	
Specific gravity	1:530 @ 20 °C	
Solubility: water	347g/100g @ 100 °C	
Solubility: ___	@ °C	
Boiling point	142 °C	
Melting point	5-11 °C	
Vapor pressure	< 1 mmHg @ °C	
Vapor density	NA @ °C	
Flash point	°C	
(open cup none; closed cup ___)		
Other: ___		

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes		
Ingestion	Yes		
Skin/eye absorption	Yes		
Skin/eye contact			
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: ___			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility	No		
Toxic byproduct(s):			
___			
___			
Flammability	No		
LFL			
UPL			
Explosivity			
LEL			
UEL			

COMMON NAME: Formaldehyde CHEMICAL NAME: Formaldehyde

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ___ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	60 g/g-mole	
Specific gravity	1:110 @ 25 °C	
Solubility: water	100% @ ___ °C	
Solubility: ___	@ ___ °C	
Boiling point	98 °C	
Melting point	___ °C	
Vapor pressure	1.0 mmHg @ 20 °C	
Vapor density	1.01 @ ___ °C	
Flash point	___ °C	
(open cup ___; closed cup 185)		
Other: ___		

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes		
Ingestion	Yes		
Skin/eye absorption	Yes		
Skin/eye contact	Yes		
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: ___			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility			
Toxic byproduct(s):			
Carbon Dioxides			
Carbon Monoxide			
Flammability	Yes		
LFL		7.0	
UPL		73.0	
Explosivity			
LEL			
UEL			

COMMON NAME: Hydrochloric Acid CHEMICAL NAME: _____

I. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas ~~Gas~~ Liquid X Solid ___ (at ambient temps of 20°C-25°C)		
Molecular weight	36.5 g/g-mole	
Specific gravity	1.160-1.179 @ ___ °C	
Solubility: water	Very Soluble @ ___ °C	
Solubility: _____	___ @ ___ °C	
Boiling point	110 °C	
Melting point	-53 °C	
Vapor pressure	50-60 mmHg @ 20 °C	
Vapor density	NA @ ___ °C	
Flash point	___ °C	
(open cup _____; closed cup _____)		
Other: _____	_____	

II. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes	TLV 5 ppm	
Ingestion	Yes	Rabbit 900 mg/kg	
Skin/eye absorption			
Skin/eye contact	Yes		
Carcinogenic			
Teratogenic			
Mutagenic			
Aquatic			
Other: _____			

B. TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility	No		
Toxic byproduct(s):			
_____			
_____			
Flammability	No		
LFL			
UPL			
Explosivity			
LEL			
UEL			

APPENDIX E

PROPOSED SCOPE OF WORK

153

DEQE ● ● REGION 1

LAST UPDATE 2/25/87 12/3/86

TOWN: MIDDLETON

STAFF IDA BABROUDI

PRIORITY: 1(A)(a)(b)

DATE DISCOVERY/NOTIFICATION: 10/20/86

NATURE OF DISCOVERY:

___ 21E MORTGAGE INVEST.
✓ COMPLAINT
___ SPILL
___ RCRA INSPECTION
___ EPA REFERRAL
___ BOH REFERRAL
___ OTHER:

SITE NAME: ADHESIVES MANUFACTURER

ADDRESS: SCHOOL STREET
MIDDLETON, MA 01949

OWNER/OPERATOR: CHERYL A. AUTERIO
(617) 774-7111

AGENT/CONTACT:

RESPONSIBLE PARTY(S): AMERICAN GLUE & RESIN, INC., LECOLST FAMILY, SHEA

___ OIL ✓ GASOLINE ✓ UST ✓ HAZ MATERIAL SIC CODE: 2891

SITE HISTORY/NARRATIVE:

NATURE OF RELEASE/CONTAMINATION

SOURCES:

✓ LAND DISPOSAL OF WASTES
✓ WASTEWATER/LIQUID DISPOSAL
✓ SPILL(S)/SPILLAGE
✓ UNDERGROUND TANKS
___ SURFACE IMPOUNDMENTS
___ UNKNOWN
___ OTHER

SITE CONDITIONS:

___ WASTES ABOVE-GROUND
___ WASTES BELOW-GROUND
___ CONTAMINATED SOIL
✓ CONTAMINATED GROUNDWATER
___ CONTAMINATED SURFACE WATER
___ SLUDGES
___ OTHER

SITE INFO/TRACKING FORM

3-168

(-) INSIGNIF (+) SIGNIF (++) SEVERE

---CONTAMINANTS---		WASTE(S)	SOIL(S)	GROUND WATER(S)	SURFACE WATER(S)	AIR/ VAPOR
METALS						
VOC	PETRO PRODUCTS			++		
VOC	NON-HALOGENATED			++		
VOC	HALOGENATED			++		
ACID EXTRACTABLES						
BASE/NEUTRALS						
PAH'S						
PESTICIDES						
PCB'S						
OTHERS:						

GENERALIZED WASTE PROFILE: _____

GENERALIZED SOIL CONTAMINATION PROFILE: _____

GENERALIZED GROUNDWATER CONTAMINATION: FLOATING PRODUCT: ___YES ___NO

Groundwater is contaminated with severe levels of 1,1-dichloroethane, 1,2-dichloroethylene, trichloroethylene, benzene, toluene, chlorobenzene, ethylbenzene, xylenes, numerous hydrocarbons, and 1,1,1-trichloroethane.

SITE DEMOGRAPHICS: ___URBAN ___SUBURBAN ✓RURAL

USGS QUAD PINK AREA: ___YES ✓NO

DISTANCE TO NEAREST PUBLIC WATER SUPPLY: ✓ GREATER 0.5 MILES _____FEET

DISTANCE TO NEAREST

TRANSPORT MECHANISMS		EXPOSURE ROUTES	
P	RUN-OFF/SURFACE WATERS	C	DIRECT HUMAN CONTACT
C	GROUNDWATER	C	INGESTION (DRINKING WATER)
P	SUBSURFACE CONDUITS	P	INHALATION DUST/VAPORS
	ATMOSHERIC VAPORS/PARTICULATES	P	AQUATIC/ANIMAL POPULATIONS
P	SUBSURFACE VAPOR MIGRATION		AQUATIC/TERRESTRIAL FOOD CHAINS

C - CONFIRMED P - POTENTIAL H - HISTORICAL

COORDINATES

UTM		LATTITUDE/LONGITUDE
N 4,719,550	METERS	42° 36' 45" N
E 333,900	METERS	71° 01' 30" W

QUADRANGLE(S): READING

REGULATORY

APPLICABLE STATUS:

___ MSCA ___ NPL ___ FIT ___ RCRA

JURISDICTIONS:

___ AG ___ EPA ___ BOH ___ DPH ___ OTHER

DEPARTMENTAL:

DATE RELEASE/REPORT ACKNOWLEDGEMENT LETTER: _____

DATE N.O.R. 12/29/86 (WRITTEN) _____ (VERBAL)

DATE ORDER(S): _____

ADMISTRATIVE PENALTY: _____

COST RECOVERY? _____

SITE STATUS:

	STARTED	DATE COMPLETED
PHASE I	✓	2/13/87
PHASE II	✓	
PHASE III		
PHASE IV		
IRM	✓	12/17/86

ENVIRONMENTAL CONSULTANT(S)

ECS, ENV. HAZ. MANAG. INSTIT.

ANALYTICAL: AES, RCH ASSOC. INC., RESEARCH CORP.

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REMEDIAL ACTIONS: ____REQUIRED ____NOT REQUIRED ____CONT. MONITORING

REMEDIATION/SITE CLEAN-UP

SOURCE

SOURCE CONTROL/MITIGATION:

____WASTE REMOVAL ____TANK REMOVAL ____ON-SITE CONTAINMENT

____SOIL/SEDIMENT REMOVAL ____AERATION/VENTING

GROUNDWATER

____FLOATABLE RECOVERY:

____GROUNDWATER PUMPING/SEPARATION/PRODUCT RECOVERY

____EFFLUENT DISPOSAL

____GROUNDWATER RECOVERY/TREATMENT/EFFLUENT DISPOSAL

____AIR STRIPPING ____ DAQC APPROVAL ____ DAQC PERMIT

____ACTIVATED CARBON

____OTHER: _____

____EFFLUENT DISPOSAL REQUIRED:

____LOCALIZED GROUNDWATER RE-INJECTION

____SANITARY SEWER

____PROCESS WATER UTILIZATION

____SURFACE WATER DISCHARGE ____ NPDES PERMIT

____GROUNDWATER DISCHARGE ____ DWPC PERMIT

PHASE V

____ DEED NOTIFICATION ____ LAND USE RESTRICTIONS

____ OTHER: _____

____ CONTINUED MONITORING: ____ QUARTERLY ____ SEMI-ANNUAL ____ OTHER

_____

_____

NOTES: _____

_____

_____

_____

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AMERICAN GLUE & RESIN CO.

PHASE I

2.30 PRODUCTION WATER MASS BALANCE

Besides Dextrin, water is the principal constituent of Dextrin glue and is also a major constituent of Acetate glue. Waters used in the manufacture may come from three sources: virgin waters (from on site well); waters collected from kettle wash down after production; and water from totes returned by customers.

The customers return totes after using the glue for refilling. Before shipping the tote back to American Glue the glue user is instructed to add a small amount of water to prevent remaining glue residue from hardening. This water is then returned into the process with remaining residue.

Additionally waters from washing down the mixing kettles are placed into totes still containing transport waters. Average volume produced per kettle wash down is between 4 to 8 gallons. These waters are then bled back into the product as needed.

Tap waters are used to supplement tote and wash waters if needed. A schematic of water usage is contained on both Figures 3 and 4.

1.00 INTRODUCTION

This Phase I report presents the findings of the multi-phase site investigation undertaken by Environmental Compliance Services, Inc. (ECS) for American Glue and Resin Co. on properties located at 40 School Street in Middleton, Massachusetts.

This report is submitted to fulfill the requirements of the Department of Environmental Quality Engineering (DEQE) Case No. 3-168 Requisite Site Action Item (1) outlined in a Massachusetts DEQE Northeast Region letter dated December 29, 1986.

Note that this report is subject to the limitations presented in Appendix A.

1.10 SITE DESCRIPTION

The American Glue and Resin Co. is located in the northwestern portion of the Town of Middleton, Massachusetts at 40 School Street (see Figure 1). The site is bounded by Boston Brook on the northwestern boundary; School Street to the southeast; to the southwest is 34 School Street a residential house; and to the northeast is 42 School Street occupied by Tom Sawyer Beverage. Across School Street to the southeast is a swamp.

The site consists of approximately 3 acres of land with one main building on site comprised of a number of additions. Also on site is a storage building and a number of storage trailers.

The site is currently, and has been since 1978, utilized by American Glue and Resin Co. a glue manufacturing facility. From 1970 to 1978 Glennon American operated a glue manufacturing facility on the premises engaging in similar manufacturing operations as the current owner. Prior to 1970 the current owners of 42 School Street (Tom Sawyer Beverage) operated a bottling company at the site.

2.00 MANUFACTURING PROCESS

American Glue and Resin Co. is a 100 percent job shop, engaged in the manufacture of Dextrin and Acetate based glues. Total annual production is between 120,000 and 140,000 gallons of glue. These glues may be one of over 100 proprietary formulas reflecting individual customers needs. These numerous formulas require raw material mix and process sequence fluctuate to meet performance specifications. A list of all raw materials along with approximate percentage of use is presented in Table 1.

2.10 DEXTRIN PROCESS

Dextrin based glues comprise 35 to 40 percent of the total annual glue production. Production volume per batch ranges from 220 to 550 gallons. A typical formula incorporates the mixing of 45 percent water and 50 percent Dextrin in a large kettle. Dextrin is a natural starch derived from either potatoes or corn. Depending upon specific formulations the remaining percentage of the raw material mix could include any of the raw materials indicated as such on Table 1. This entire mixture is then heated to a temperature of approximately 140°F for about two hours. After heating it is allowed to cool. Once cooled preservatives including Formaldahyde or Dowacide A are added and the batch is remixed. The mixture is then poured into the appropriate shipping container (tote or drum). The kettle is then cleaned with a high pressure wash before the next batch is begun. A schematic of the entire process is shown in Figure 3. It should be noted that no volatile organic constituents are utilized in this process.

2.20 ACETATE PROCESS

Acetate based glues comprise 60 to 65 percent of the total produce mix. Typical batch sizes range from 220 to 1,100 gallons which are mixed in large mixers. Small batches however are occasionally mixed directly in 55 gallon drums. The formula consists of anywhere from 70 to 90 percent Acetate which is essentially Elmers Glue. Like Dextrin based glues, production of Acetate based glues is contingent upon the variability of the individual job orders. Consequently, the remaining percentage of the raw material mix for Acetate glues will contain water and one of the materials listed as such on Table 1. This entire blend is then mixed and subsequently placed into the appropriate transportation container (tote or drum). A schematic of the process is contained in Figure 4. The mixing vessel is then cleaned with a high pressure cleaner.

Production data reveals that approximately 50 percent of Acetate glue production incorporates volatile organic constituents usage ranging from 2 to 7 percent. These are principally 1,1,1-Tirchloroethane and Toluene (Toluol).

AMERICAN GLUE PROPOSAL

AMERICAN GLUE PROPOSAL

The following is a summary of Environmental Compliance Services, Inc.'s (ECS) planned multi-phase effort which is designed to determine if any on site sources present at American Glue Corp. located on School Street in Middleton, Massachusetts, may be contaminating area groundwaters.

The direct objectives of this study are to at a minimum determine:

1. The potential of any detrimental human health affects;

2. The identification, concentration and delineation of any hazardous constituents in the soils and/or groundwater;

3. The most probable migration direction of any hazardous constituents found on site;

4. The impacts of the migration and concentration of any hazardous constituents on sensitive environmental receptors.

5. Develop recommendations ensuring compliance with applicable regulatory constraints in accordance with 314 CMR 5.00, 310 CMR 30.000 and 527 CMR 9.00.

6. Recommend alternative courses of action.

PHASE I - Review of Background Data

ECS will review all available existing data related to the site which will aid in completing the objectives of this proposal. Currently, this will include:

- Identification of all on site potential sources of contamination.

  a. Identify, inventory and characterize all raw materials associated with current and historical on site manufacturing processes.

  b. Review all current waste disposal practices and develop recommendations to insure regulatory compliance.

  c. Review facilities inventory of underground storage tanks.

- Identification of any nearby off site potential sources.

- Review of available drinking water well completion data for on site and off site wells to identify if wells are surficial or bedrock.

- Inspection of on site and if possible off site drinking water wells to determine their integrity.

- Review of available water quality data within the associated area.

- Review of regional geologic data.

PHASE II - Identification of On Site Groundwater Contamination & Hydrogeologic Conditions

In order to determine if groundwater contamination is present on site a water table aquifer monitoring program is proposed. It should be noted that results of this investigation may indicate the need for a multi-level, i.e. deep unconsolidated and/or a bedrock monitoring program.

Well Installation

Based on information gained from PHASE I, ECS will devise a water table aquifer quality evaluation program.

Available information indicates four (4) to six (6) monitoring wells will be initially installed. Locations of these wells will be down gradient of potential on site sources identified in PHASE I. At least one well will be installed in an up gradient location to indicate background or baseline conditions.

Groundwater monitoring wells will be installed in borings drilled by hollow stem auger technique.

Soil sampling will be conducted every five (5) feet to a depth at least five (5) feet below the water table by standard penetration test with an eighteen (18) inch split tube sampler driven with a 140 pound hammer. If contamination is encountered in soils, continuous sampling may be employed. Detail specifications of drilling equipment standards can be found in Appendix A. Field boring logs of strata encountered will be kept.

Soil samples will be screened in house using an HNU Model PI-101 Photo Ionization Detector. Based on this screening, selected samples will be forwarded to a certified laboratory for volatile organic analysis (EPA Method ~~624~~ 8240).

Groundwater Sampling

ECS will conduct one (1) round of sampling. The round will include groundwater level measurements, sample collection and delivery of properly preserved water samples to a laboratory for chemical analysis. Samples will be collected from existing drinking water wells and proposed monitoring wells. ~~Two (2) additional surface water samples from the stream and the swamp area, will be collected.~~ Groundwater sample collections, preservation techniques and chain of custody procedures will be the same as EPA protocols as outlined in U.S. EPA Publication SW-846 and Appendix C. Samples will be analyzed for volatile organic contamination. Determination of the presence and height of any "floating" layer will be noted during sampling.

pH + cond

APPENDIX C

FORM 290

APPENDIX D

MIDDLETON BOARD OF HEALTH MEMO

Gleason American

6-21-73

Investigated a complaint by Mrs Donald Hall 171 Liberty St. That a tank truck was dumping waiste product into a swamp next to a glue factory.

Went with her to site. Found washing material off road into swamp. Material found to be white & sticky, very mild odor, water soluable. mild tar. Told substance is a latex product, Biodegradable, not harmful.

Talked with Mr Richard Sloan Plant Manager (owner)

He said that the trucks would drain out in the future in the plant yard where any stuff that falls to the ground would be on his property - Apologized for mistake

Returned to office. Told Mrs Hall to contact me if she encountered further violation

PHASE II - Identification of On Site Groundwater Contamination & Hydrogeologic Conditions (cont'd)

Groundwater Sampling (cont'd)

A summary of findings at this point will be submitted to DEQE in a brief letter report.

All wells along with surface water bodies will be surveyed and gauged for depth to groundwater to establish relative groundwater elevations to aid in the preparation of groundwater contours and flow direction.

Tank Removal

ECS will be present to inspect the removal of on site tanks. Soils exposed during excavation will be field screened to determine if any volatile organic contamination is present. Also the structural integrity of tanks will be visually verified.

Septic System and Storm Sewer Review

ECS will review design specifications, structural performance, and the integrity of the existing on site septic system, as well as develop recommendations delineating future use limitation and/or new septic system design criteria. Additionally, on site storm sewers will be inspected to establish their construction and destination. Dye tests will be conducted on both systems to aide in determination of their destination and possible interconnection.

PHASE III - Hydrogeologic and Water Quality Evaluation

A summary of the hydrogeologic conditions beneath the site will be made. This report will be based on information gained as part of this study, information from previous studies, and other information available from USGS, DEQE and other agencies. This will include:

1. Types and characteristics of subsurface materials found on site.

2. Determination of groundwater flow direction.

3. Provide any additional hydrogeologic data pertinent to the evaluation of the probable migration routes of contaminated groundwater, and the means by which an assessment of the existing and future quality of the groundwater may be estimated.

This information along with water quality data will be used in a groundwater quality evaluation. This will include:

1. Delineation of potential contaminated area.

2. Estimation of level of contamination and identification of specific constituents.

3. A limited risk assessment relative to water solubility, toxicity, biodegradibility, and potential areas of exposure to sensitive receptors will be conducted.

If on site contamination is confirmed and levels are signficant ECS will prepare a recommended course of action for approval to the DEQE. This report will be reviewed with American Glue prior to submission to DEQE.

cont'd - rec'd from
MA DEP 12/92

ESTIMATED PROJECT TIME TABLE

	WEEK								
	1	2	3	4	5	6	7	8	9
PHASE I									
Review of Background Data	X	X							
PHASE II									
Well Installation (weather permitting)				X					
Groundwater Sampling					X	X			
Tank Removal	At Owners Discretion								
Septic System & Storm Sewer Review (weather permitting)				X					
PHASE III									
Preliminary Report							X	X	
Final Report									X

APPENDIX A

DRILLING EQUIPMENT STANDARDS

1. Equipment Decontamination

All drilling equipment and associated tools, including but not limited to, augers, drill rods, sampling equipment, wrenches, etc., that may have come in contact with any material which could cause contamination shall be decontaminated using a high pressure detergent steam cleaning equipment, followed by, if needed a nanograde methenol swabbing. This will be followed by a distilled or controlled water rinse. The control water shall be obtained from a source approved by the supervising field representative. Where does the waste go?

2. Equipment and Materials

All equipment will be in good repair and in proper working order with no visible signs of oil or hydraulic fluid leaks.

The drill rig shall be capable of providing a power driven sectional hollow stem auger flights with a minimum inside diameter of 2 1/2 inches to a minimum depth of 60 feet. In addition, the following equipment shall be available:

A. Drill Rods, minimum size equivalent to the "A" Rod, (1 5/8 inch O.D. and 1 1/8 I.D.),

B. 140 lb. Drive Hammer and 300 lb. Drive Hammer,

C. 2 Inch O.D. Split Spoon Sampler,

D. Hollow Stem Auger Plug,

E. Roller Bit and Diamond Corer Bit,

F. Water Tank and Pump,

G. Any other equipment needed to successfully complete job.

APPENDIX B

MONITORING WELL CONSTRUCTION

I. Materials

All materials used in the completion of monitoring wells shall be in good condition and free of any signs of possible contamination. The following materials may be used in the completion of monitoring wells:

1) 2" Flush Joint Threaded PVC Well Screen and Riser Casing (Schedule 40 or 80)

2) Washed Ottawa Sand

3) Bentonite Grout

4) Portland Cement

5) Filter Fabric

6) Vented Steel Locking Well Casing and Lock or Curb Box

II. Installation

At the selected depth has been reached by augering, placement of a specified length of PVC screen and riser will be installed into the augers. If warranted, filter fabric should be placed on screen prior to insertion into auger to facilitate filtration. Ottowa sand will be used to pack the screen to prevent plugging. Retrack augers to top of screen and measure with weighted tape to ensure the screen has been fully covered. Add enough bentonite until the screen has been sealed off from horizontal and/or vertical flow above the screened interval. Again, measure to assure bentonite is not "hung up" in casing.

The auger string is again pulled back and natural soils are allowed to collapse. Measurements should be made to assure this collapse. If natural materials are not collapsing, clean ottawa sand will be used to fill the voids. Install an additional bentonite seal two (2) to three (3) feet below ground level.

Once the auger string has been removed the protective steel casing will be installed. Said steel pipe will be secured by a portland cement seal. The cement seal shall be a minimum of two (2) foot in diameter and shall be gently sloped to drain water away from well.

APPENDIX C

WELL SAMPLING

I. Materials

All materials used in sampling shall be in good working order and should have been cleaned prior to use if applicable. The following materials are needed to ensure proper sampling:

1) Appropriate Sample Containers (supplied by laboratory)

2) Precleaned Stainless Steel or PVC Bailers

3) Sampling Cable

4) 100 Foot Steel Tape with Weighted End or Other Acceptable Water Level Measuring Device

5) Field Notebook & Chain of Custody Sheet

II. Cleaning of Bailers

1) Bailer should first be rinsed with potable water.

2) Bailer will then be rinsed with methanol.

3) Rerinse with potable water.

4) Rinse bailer with distilled water.

5) Allow bailer to air dry.

6) Follow same procedure for bailer cable.

III. Procedure

1) Always start sampling at up gradient (presumed least affected) well location and continue on to the most heavily affected.

2) Keep accurate field notes of any and all measurements and observations.

3) Measure depth to groundwater to nearest 0.1 foot using 100 foot steel rule. how ?

4) Take a sample of the top one (1) foot of water with precleaned bailer.

APPENDIX F

SITE SAFETY PLAN

SITE SAFETY PLAN

(To be completed prior to the implementation of Phase II)

A. SITE DESCRIPTION

Date _____ Location _____

Hazards _____

Area affected _____

Surrounding population _____

Topography _____

Weather conditions _____

Additional information _____

B. ENTRY OBJECTIVES - The objective of the initial entry to the contaminated area is to (decribe actions, tasks to be accomplished; i.e., identify contaminated soil; monitor conditions, etc.) _____

C. ON SITE ORGANIZATION AND COORDINATION - The following personnel are designated to carry out the stated job functions on site. (Note: One person may carry out more than one job function.)

PROJECT TEAM LEADER _____

SITE SAFETY CONTACT _____

PUBLIC INFORMATION CONTACT _____

FIELD TEAM LEADER _____

FIELD TEAM MEMBERS _____

FEDERAL AGENCY REPS _____

STATE AGENCY REPS _____

LOCAL AGENCY REPS _____

CONTRACTOR(S) _____

All personnel arriving or departing the site should log in and out with the Site Safety Officer. All activities on site must be cleared through the Project Team Leader.

D. ON SITE CONTROL

_____ has been designated to coordinate access control and security on site. No unauthorized person should be allowed on the site.

The on site Command Post and staging area have been established at _____

Site and control boundaries are identified by: _____

E. HAZARD EVALUATION

The following substance(s) are known or suspected to be on site. The primary hazards of each are identified.

Substances Involved (chemical name)	Concentration (If Known)	Primary Hazards (e.g., toxic on inhalation

The following additional hazards are expected on site: (i.e., slippery ground, uneven terrain, etc.) _____

Hazardous substance information form(s) for the involved substance(s) have been completed and are attached (see attachment).

F. PERSONAL PROTECTIVE EQUIPMENT

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

Location	Job Function	Level of Protection
Exclusion Zone	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
Contamination Reduction Zone	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other
	_____	A B C D Other

Specific protective equipment for each level of protection is as follows:

Level A _____

_____

_____

_____

_____

Level B _____

_____

_____

_____

_____

Level C _____

_____

_____

_____

_____

Level D _____

_____

_____

_____

_____

Other _____

_____

_____

_____

G. ON SITE WORK PLANS

Work party(s) consisting of _____ persons will perform the following tasks:

Project Team Leader _____(name)_____ _____(function)_____

_____

_____

Work Party #1 _____

_____

_____

_____

Work Party #2 _____

_____

_____

_____

Rescue Team _____ _____
(required for _____
entries to IDLH _____
environments) _____

Decontamination _____ _____
_____
_____
_____

The work party(s) were briefed on the contents of this plan at _____.

(Horn blast, siren, etc.) is the emergency signal to indicate that all personnel should leave the Exclusion Zone. In addition, a loud hailer is available if required.

The following standard hand signals will be used in case of failure of communications:

Hand gripping throat	Out of air, can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, Negative

I. DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The standard level ____ decontamination protocol shall be used with the following decontamination stations: (1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ (7) _____ (8) _____ (9) _____ (10) _____ Other _____

Emergency decontamination will include the following stations: _____
_____
_____
_____

The following decontamination equipment is required: _____
_____
_____
_____

(Normally detergent and water) will be used as the decontamination solution.

J. SITE SAFETY AND HEALTH PLAN

1. (name) is the designated Site Safety Officer and is directly responsible to the Project Team Leader for safety recommendations on site.

Personnel Injury in the Exclusion Zone: Upon notification of an injury in the Exclusion Zone, the designated emergency signal _____ shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The Site Safety Officer and Project Team Leader should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone. The on site EMT shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symtoms is determined.

Personnel Injury in the Support Zone: Upon notification of an injury in the Support Zone, the Project Team Leader and Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, with the on site EMT initiating the appropriate first aid and necessary follow-up as stated above. If the injury increases the risk to others, the designated emergency signal _____ shall be sounded and all site personnel shall move to the decontamination line for further instructions. Activities on site will stop until the added risk is removed or minimized.

Fire/Explosion: Upon notification of a fire or explosion on site, the designated emergency signal _____ shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure: If any other equipment on site fails to operate properly, the Project Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the Exclusion Zone cannot occur through the decontamination line: _____

2. Emergency Medical Care

First-aid equipment is available on site at the following locations:

First-aid kit _____
Emergency eye wash _____
Emergency shower _____
(other) _____ _____

Emergency medical information for substances present:

Substance	Exposure Symptoms	First-Aid Instruction

List of emergency phone numbers:

Agency/Facility	Phone #	Contact
Police		
Fire		
Hospital		
Airport		
Public Health Advisor		

3. Environmental Monitoring

The following environmental monitoring instruments shall be used on site (cross out if not applicable) at the specified intervals.

Combustible Gas Indicator - continuous/hourly/daily/other _____
O_2 Monitor - continuous/hourly/daily/other _____
Colorimetric Tubes - continuous/hourly/daily/other _____
(type) _____ _____
_____ _____
_____ _____
HNU/OVA - continuous/hourly/daily/other _____
Other _____ - continuous/hourly/daily/other _____
_____ - continuous/hourly/daily/other _____

4. Emergency Procedures (should be modified as required for incident)

The following standard emergency procedures will be used by on site personnel. The Site Safety Officer shall be notified of any on site emergencies and be responsbile for ensuring that the appropriate procedures are followed.

In all situations, when an on site emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The Site Safety Plan has been reviewed.
4. Site personnel have been briefed on any changes in the Site Safety Plan.

All site personnel have read the above plan and are familiar with its provisions.

	Name	Signature
Site Safety Officer		
Project Team Leader		
Other Site Personnel		